

DYNA3D

A workhorse code for U.S. industry

DYNA3D—dynamics in three dimensions—is a nonlinear structural dynamics code that can analyze the complex structural response of mechanical systems to high-rate loadings and impacts. Basically, the program simulates the effect of stress on structures. Like many other engineering codes, DYNA is based on finite-element analysis, a method of examining physical systems by breaking them into discrete but interconnected pieces. What makes DYNA different is its ability to span a broad spectrum of mechanical problems and computing environments. Developed over 15 years ago to study the effects of weapons systems, DYNA is amazingly versatile. Though the code was developed for supercomputer applications, it is now used on a variety of machines—from multimillion-dollar Crays to \$20,000 scientific workstations.

APPLICATIONS

- Simulating surgical procedures, body injuries for medical equipment
- Studying stress on steel, concrete, and other materials
- Testing and "correcting" the design of materials, processes, and products before the prototype stage
- Modeling car crashes and designing safer cars; aircraft analysis, including effects of birds striking airplanes; train accident analysis

Creating new solutions to old problems

Over 1,000 organizations use the publicly available software, including automobile manufacturers, aerospace companies, nuclear energy firms, defense contractors, computer companies, engineering firms, and universities. As the number of computer workstations has grown exponentially in the past few years, LLNL has seen an explosive growth in the use of DYNA nationwide. The engineering problems have

always been there, but scientists and engineers now have the tools at their fingertips to go after these problems.

DYNA is available to collaborators

DYNA's users are now drawn from almost every sector of industry, as well as universities and research and development laboratories.

As researchers apply DYNA to specific problems, they often find ways to improve it. The code's broad distribution and use have resulted in a variety of new and unexpected applications. Development of the code continues on a scale that would be impossible were DYNA used only at LLNL. The process of releasing a software product into a world of sophisticated users and letting them collaborate on its future growth is yielding tremendous benefits for both users and developers.

The future—tackling problems 1000 times more complex

LLNL is continuing to enhance DYNA, making faster, more accurate models of physical contact between two bodies, such as the impact of a vehicle into a highway barrier. LLNL also has an active research program focusing on extending DYNA to take advantage of the computing power of next-generation, massively parallel computers. The ability to tackle problems 1,000 times more complex than those being handled today, faster and at lower cost, is the expected result.

Availability: The technology is available now.

Contacts

Gerald L. Goudreau
 Phone: (510) 422-8671
 Fax: (510) 422-2085
 E-mail: goudreau1@llnl.gov
 Mail code: L-122

Jerry Lin
 Phone: (510) 423-0907
 Fax: (510) 422-2085
 Mail code: L-122